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Development and Proof Services

AUTOMOTIVE DIVISION

REPORT ON

EVALUATION TEST OF ANTISEIZE COMPOUND FOR TANK AND VEHICLE APPLICATION

Report No. DPS-252

(OMS Code 5010.11.80000.01)

(D.A. Project No. 551-01-011)

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FOR THE DIRECTOR

JULY 1961

Aberdeen Proving Ground
Maryland

DEVELOPMENT AND PROOF SERVICES
ABERDEEN PROVING GROUND
MARYLAND

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EVALUATION TEST OF ANTISEIZE COMPOUND FOR TANK AND VEHICLE APPLICATION

Report No. DPS-252

Dates of Test: 6 October 1959 to 4 May 1961

ABSTRACT

The test antiseize compound (F.I.L. 15-13-2) was applied to steel mating parts on an M59 armored personnel carrier, and the vehicle was operated 3090 miles. This compound did not meet the standards necessary for acceptance.

A second test antiseize compound (F.I.L. 15-13-2A) was applied to steel mating parts on a T95E8 tank, and the vehicle was operated 204 miles. (When not being operated, the vehicle was parked in an open area, exposed to the effects of all types of weather.) This compound did not meet the standards necessary for acceptance.

CONTENTS

	PAGE
INTRODUCTION	3
DESCRIPTION OF MATERIEL	3
DETAILS OF TEST	3
Procedure - F.I.L. 15-13-2	3
Results - F.I.L. 15-13-2	4
Procedure - F.I.L. 15-13-2A	6
Results - F.I.L. 15-13-2A	7
Results - General	11
CONCLUSIONS	11
RECOMMENDATIONS	13
APPENDIX A: CORRESPONDENCE	A-1
APPENDIX B: DISTRIBUTION	B-1

1. INTRODUCTION

There has been a need for a coating that will aid in the disassembly of mating steel parts that are prone to seizure due to products of corrosion. Such conditions have been found between the torsion bar serrations and anchor block, between track pins and end connectors, sprockets and hubs, hubs and drive shafts, compensating arm spindles and hull, etc., of tracked vehicles.

Two antiseize compounds were received at Aberdeen Proving Ground for testing to determine if they were capable of assisting in the ease of disassembly of mating steel parts, of preventing seizure and corrosion, and of supplying a measure of lubrication (see Appendix A).

2. DESCRIPTION OF MATERIEL

The base stock of both the F.I.L. 15-13-2 and F.I.L. 15-13-2A antiseize compounds contains teflon and zinc chromate. The diluent for both is methyl isobutyl ketone (MIBK), TT-M-268. These base stocks were each mixed with the diluent until they were at brushing consistency and then applied to parts of the vehicles - the F.I.L. 15-13-2 to the M59 and the F.I.L. 15-13-2A to the T95E8 - in accordance with the manufacturer's instructions (Appendix A).

3. DETAILS OF TEST

3.1 Procedure - F.I.L. 15-13-2 and Carrier, Personnel, Full-Tracked, Armored, M59, USA No. 12K326

The vehicle was partially disassembled, and the antiseize compound was applied to the following steel mating parts on the right side of the vehicle (for mixing and application instructions, see Appendix A, pages A-7 and A-8):

a. Torsion bars serrated end (road wheel side).

b. Sprocket hub flange.

c. Track pins.

d. Track pad nuts.

e. Shock pins.

f. Compensating idler link pins.

g. Compensating idler adjusting screw (threaded end).

h. Compensating idler adjusting screw (eye).

i. Compensating idler adjusting screw (arm).

Vehicle operation is summarized in Table I.

Table I. Vehicle Operation

	Miles
Gravel	50
Churchville cross-country	3000
Miscellaneous	40
Total	3090

3.2 Results - F.I.L. 15-13-2 and M59

3.2.1 General. An initial inspection of several component parts of the M59 APC coated with the F.I.L. 15-13-2 antiseize compound was made after 2094 miles of service. These vehicle components consisted of the compensating idler link pin, torsion bar, shock absorber, and one track pin. The front link pin was removed easily but was heavily worn; there was some compound remaining on the pin. The shock absorber was readily separated from the tapered pin. Although the track pin was easily removed, the compound had rubbed away from the area in contact with the pin. The torsion-bar serrations still retained some compound, but the compound was flaking away from the surfaces of the serrations. These components were reassembled without additional coatings of the antiseize compound and vehicle operation continued.

3.2.2 Torsion Bars. All torsion bars treated with F.I.L. 15-13-2 antiseize compound were removed after 3090 miles of operation. In addition, for comparison purposes two of the untreated torsion bars in the left side of the vehicle were removed. These comparison bars had been reassembled dry when the test antiseize compound was applied to the serrations (road wheel end) on the torsion bars on the right side of the vehicle. Difficulty was encountered when attempting to remove each of the antiseize-treated torsion bars. A standard Tee hammer would not remove these torsion bars. They were all removed, except No. 1 right, using moderate to heavy blows with a slide hammer. There was a slight trace of the compound remaining in the serrations on all of the antiseize-treated torsion bars. Number 1 right torsion bar was frozen and could not be removed with a slide hammer. A portable portopower was used to remove this bar. Inspection of the serrations revealed evidence of compound remaining on the serrations. The two nontreated torsion bars were readily removed with a Tee hammer.

3.2.3 Sprocket Hub Flange. Both the antiseize-treated sprocket and the nontreated sprocket were easily removed from their respective hubs, with approximately the same amount of effort.

3.2.4 Track Pins. Forty-two T91E3 track pins were coated with F.I.L. 15-13-2 antiseize compound, while 10 pins were wiped dry and the remaining 20 pins were left in the 'as-received' condition (i.e., with the manufacturer's standard preservative compound on them). The as-received track pins were still coated with their original preservative at the completion of the test and were easily removed. These pins did not show any evidence of corrosion and only minor wear. The ten dry pins were moderately corroded and slightly worn. These pins were harder to remove than the as-received pins; none of these pins was frozen. Out of 42 pins coated with the antiseize compound, eight were frozen. To remove one of the frozen pins a hydraulic press was used and a force of approximately nine tons applied. This pin could not be removed with either a portopower or a hydraulic press, and it was necessary to cut a portion of the pin away to free the portopower adapter (for extruding track pins), which became frozen to the pin when the bushings were drawn into it. No attempt was made to hydraulically press out the remaining seven frozen pins. Table II summarizes the degree of effort required to remove the track pins.

Table II. Degree of Effort Required to Remove Track Pins
(Those pins unaccounted for had frozen pin nuts or were not considered in the sample.)

Method of Treatment and Sample Size	Effort to Break Loose			
	Less than Normal	Normal	Normal to Severe	Frozen
Antiseize (F.I.L. 15-13-2) treated pins (42)			34	8
Dry pins (no preservative) (10)		8	2	
Pins with Standard Preservative (16) (as-received condition)	1	14	1	

3.2.5 Track Pad Nuts. All the track pad nuts were removed and retightened with a torque wrench to 360 lb-ft. Ten of these pads were treated with the test antiseize compound prior to being torqued. In an effort to determine the effectiveness of the antiseize compound after 3090 miles of operation, 25 track pad nuts were loosened with a torque wrench to ascertain the torque required to break the nut loose and the prevailing torque after loosening. The track pad nuts were of the self-locking type and those treated with antiseize compound showed no evidence of any compound remaining. The average torque required to break loose the nuts treated with antiseize compound was 4000 in-lb, with an average prevailing torque of 550 in-lb. The track pad nuts that were not treated with antiseize compound were broken loose at approximately 3600 in-lb with an average prevailing torque of 400 in-lb.

3.2.6 Compensating Idler Wheel Link Bolt. No comparison could be made between the antiseize-coated bolt and the nontreated bolt since the nontreated bolt was frozen because of damage to the assembly. The antiseize-treated bolt was easily removed, but there was no evidence of compound remaining on

the mating surface of the bolt. It should be noted that this assembly was also damaged, so that it is impossible to make a fair evaluation of the compound. This antiseize-treated bolt was removed after 2094 miles of service as discussed in paragraph 3.2.1.

3.2.7 Compensating Idler Wheel Support Arm. This item was originally treated with antiseize compound, but upon final inspection it was noted that most of the compound had flaked loose. There was evidence of considerable dirt and corrosion on the arm. Removal of the assembly was difficult with respect to degree of effort generally required for removal.

3.2.8 Compensating Idler Wheel Eye Bolt. The compensating idler wheel eye bolt is mated to the compensating wheel support arm and track-adjusting nut. Most of the compound had flaked loose from the eye, but there were traces of some of the compound remaining. Rust was beginning to form on the mating surface of the eye. Antiseize compound was still present on the threaded portion of the bolt, and usually this bolt is readily removed, as was the case in this instance.

3.2.9 Compensating Idler Wheel Link Arm. The compensating idler wheel link arm is mated to the compensating idler wheel support arm. The link arm had some of the antiseize compound remaining in the areas not exposed to dirt. For comments on the condition of the support arm refer to paragraph 3.2.7. There was considerable dirt and corrosion on the link arm itself and it was difficult to remove the link arm from the support arm.

3.2.10 Shock Absorbers. Both the antiseize-treated and nontreated shock absorbers were readily broken from their respective pins. The lower bearing on all shock absorbers was heavily worn, and a considerable amount of corrosion was present.

3.3 Procedure - F.L.L. 15-13-2A and Tank, Experimental, Full-Tracked, T95E5, USA No. 981053

The vehicle was partially disassembled, and the antiseize compound was applied to the following steel mating parts on the right side of the vehicle (for mixing and application instructions, see Appendix A, pages A-16, A-17 and A-18):

a. Track pins and bushings.

b. Track pad nuts and studs.

c. Shock absorber anchor pins, bushings and brackets.

d. Compensating idler anchor pin, bushings and brackets.

e. Torsion bar ends (road wheel end), anchors, anchor mounts.

f. Torsion bar plugs and screws.

g. Sprocket hub and final-drive flanges.

h. Engine compartment rear door hinges and pins.

i. Fender storage compartment lid handles and bushings.

This vehicle was operated only 204 miles; however, the vehicle, with the antiseize compound applied, was exposed to the weather for 11 months - from July 1960 to May 1961. Consequently, the results of the comparison between antiseize-treated and nontreated components are not as definitive as in the case of the M59 and F.I.L. 15-13-2 compound. Further, at the time of the application of the compound to the T95 vehicle parts, the like parts on the left side of the vehicle were not disturbed - that is, cleaned and lubricated. To accurately compare the difficulty encountered in disassembly of the compared parts on the right and left sides of the vehicle, a porto-power with a pressure gauge and several torque wrenches were used to measure the effort required to break loose the various parts.

3.4 Results - F.I.L. 15-13-2A and T95E8

3.4.1 Track Pins and Bushings. Both the test pins and bushings and the pins and bushings coated with the manufacturer's standard preservative showed only minor wear. However, the antiseize compound had chipped and flaked off to a great degree, leaving the pins unprotected, whereas the pins coated with the standard preservative were still so coated. The results, showing the greater effort required in disassembling the antiseize-treated parts, are summarized in Table III.

Table III. Amount of Effort (pounds force) Required to Break Loose Track Pins from Track Bushings

	Track Pins	
	Antiseize	Normal
	361	670
	645	464
	542	438
	670	387
	1289	387
	645	645
	387	516
	954	464
	1470	464
Average	773.7	492.7

3.4.2 Track Pad Nuts and Studs. The track pad nuts and studs treated with antiseize compound were easier to break loose and remove than the nine not so treated. However, the antiseize compound was beginning to chip and flake away, thereby leaving the metal parts completely exposed. The results are summarized in Table IV.

Table IV. Amount of Effort (ft-lb) Required to Break Loose Track Pad Nuts

	Track Pad Nuts	
	Antiseize	Normal
	140	175
	130	135
	133	130
	135	185
	140	195
	150	195
	155	170
	115	155
	133	185
Average	136.8	169.4

3.4.3 Shock Absorber Pins, Bushings, and Brackets. The antiseize-treated shock absorber anchor pins connecting the shock absorbers to the road wheel arms required no effort to remove. However, the antiseize compound had chipped and flaked off almost completely, thereby allowing the pins to rust and become pitted. On the left side of the vehicle the rear shock absorber had been removed, leaving only the front. The anchor pin connecting this shock absorber to the road wheel arm had been forced into the bushing at an angle and was binding, thereby cancelling out any comparison of break-away forces needed for disassembly. However, this pin was still in good condition, with no rusting or pitting.

The antiseize-treated anchor pins connecting the shock absorber to the vehicle hull required much more effort to break away than the one anchor pin on the opposite side, as shown in Table V. These two treated anchor pins were in the same condition as the two mentioned above. However, the normal anchor pin on the left side was also slightly rusty, but not to as great a degree.

Table V. Amount of Effort (pounds force) Required to Break Loose Anchor Pins from Hull Bracket

	Shock Absorber Pin (Bracket)	
	Antiseize	Normal
Front Pin	7736	645
Rear Pin	5415	-
Average	6575.5	645

The antiseize compound applied to the shock absorber bushings had flaked away almost completely, especially on the front shock absorber. Further, one bushing was badly scored, and another was rusty. On the left side of the vehicle, the bushings of the one shock absorber were normal, with only a slight bit of rust in one.

3.4.4 Compensating Idler Link Pins, Bushings, and Brackets. The antiseize-treated compensating idler anchor pin required approximately one-half the effort to break it loose as did the standard treated anchor pin (2320.74 pounds of force vs. 4383.62 pounds of force - possibly a result of misalignment of the bushings when the standard pin was inserted). Further, almost all of the antiseize compound had chipped and flaked away, and the pin was rusty and pitted, a condition not present on the normal pin.

The bushing of the compensating idler arm still had most of the antiseize compound present, although flaking, whereas the bracket bushing had almost none left and was slightly rusty. The bushing of the arm on the left side was scored as a result of being improperly aligned when the pin was inserted, but it was clean. The bracket bushing (left side) was slightly rusty.

3.4.5 Torsion Bar Ends (Road Wheel End), Anchors, Anchor Mounts. The antiseize-treated torsion bars required more effort to break loose than did the normal torsion bars. Also, the antiseize compound was almost completely chipped and flaked off the serrated ends. The ends of the bars on the left side were normal (with the exception of No. 5, which could not be pulled and inspected due to a stop weld to the hull of the vehicle which prevented the road wheel arm from hanging free - see Figure 1). The results are summarized in Table VI.

Table VI. Amount of Effort (pounds force) Required to Break Loose Torsion Bars

No.	Torsion Bars	
	Antiseize	Normal
1	258	26
2	129	0
3	516	0
4	774	258
5	645	-
Average	464.4	71.0

Figure 1: Metal Stop-Welded to T95E5 Hull, Acting as a Substitute Shock Absorber.

Two anchors on each side were chosen at random for inspection. The two treated with antiseize compound readily fell free, while the two untreated required a great deal of effort to free - as a result of sand and dirt which was caked around them. A great deal of the compound had come off the treated anchors.

The anchor mounts which had been treated had very little compound left. All four anchor mounts were rusty, and the untreated ones were dirty as well.

3.4.6 Torsion Bar Plugs and Screws. All of the plugs and screws, treated and untreated, were in good condition, although the antiseize compound had flaked away, with only about 1/2 to 2/3 still present. The treated plugs were easier to break loose than the normal plugs, whereas the opposite was true of the screws. For the effort required, see Table VII.

Table VII. Amount of Effort (ft-lb) Required to Break Loose Torsion Bar Plugs and Screws

Torsion Bar Plugs			Torsion Bar Screws	
Antiseize	Normal		Antiseize	Normal
350	560	No. 1	90	50
50	40	No. 2	40	60
100	160	No. 3	30	20
180	60	No. 4	Loose	40
80	400	No. 5	80	0
152.0	244.0	Average	58.0	34.0

3.4.7 Sprocket Hub and Final-Drive Flanges. There was almost no compound remaining, and the treated sprocket hub was somewhat rusty. The normal sprocket hub was less rusty than the treated hub, and only about one-fourth the effort was needed to break it loose - 150 ft-lb vs. 625 ft-lb for the treated hub.

3.4.8 Engine Compartment Rear Door Hinges and Pins. After the doors had been balanced so that there was no pressure applied, the antiseize-treated pins were lifted out by hand, as is normally the case. The top pin had had almost all of the compound flaked off, was scored, and was rusty. The bottom pin still had almost all of the compound present but it had been bent out of line and was rusty. Both top and bottom bushings were rusty, and most of the compound had flaked off.

On the left side it was not possible to balance the door and relieve the pressure put on the pins. Both pins had to be beaten out and were rusty their full length; in addition the top pin was scored.

3.4.9 Fender Storage-Compartment Lid Handles and Bushings. There was almost no compound left on all handles on the right side, and two of them were scored. Very little effort was required to remove them. On the left side the handles were very hard to remove because paint had cemented them to the bushings; when the handles were disassembled paint was present on three of them. Other than the paint, all normal handles were clean, although one was pitted and scored.

Three of the four treated bushings had no apparent antiseize compound remaining, and only a small amount was left on the fourth. The untreated bushings were generally clean and had paint on them.

3.4.10 Comparative Efforts. Figure 2 shows the comparative efforts required to break loose parts on the T95 vehicle.

3.5 Results - General

Use of either of the two antiseize compounds does not preclude binding between mating surfaces, but rather enhances binding, particularly between close-fitting mating parts. The natures of the two compounds are such that, when applied to surfaces under load, the compounds tend to chip and flake away, exposing completely clean metal surfaces to the effects of friction and weather, usually with adverse results, such as corrosion and seizure.

The compound failed to ease separation of mating parts on all coated items on the M59 (F.I.L. 15-13-2) and on almost all coated items on the T95 (F.I.L. 15-13-2A). In instances where the compound was applied to parts normally coated with a standard preservative, such as track pins, it was found that the standard preservative was as well or better suited than the test compounds.

4. CONCLUSIONS

Both experimental antiseize compounds have a tendency to cause close-fitting mating parts to bind (such as torsion bar serrated end in road wheel arm assembly).

Both antiseize compounds have a tendency to flake off mating surfaces that are under load (e.g., track pins) with a resultant formation of corrosion.

Present preservatives and lubricants used are more effective chemical agents in preventing corrosion than the antiseize compounds tested.

Mating surfaces treated with the test antiseize compounds are generally more difficult to separate than mating surfaces assembled dry.

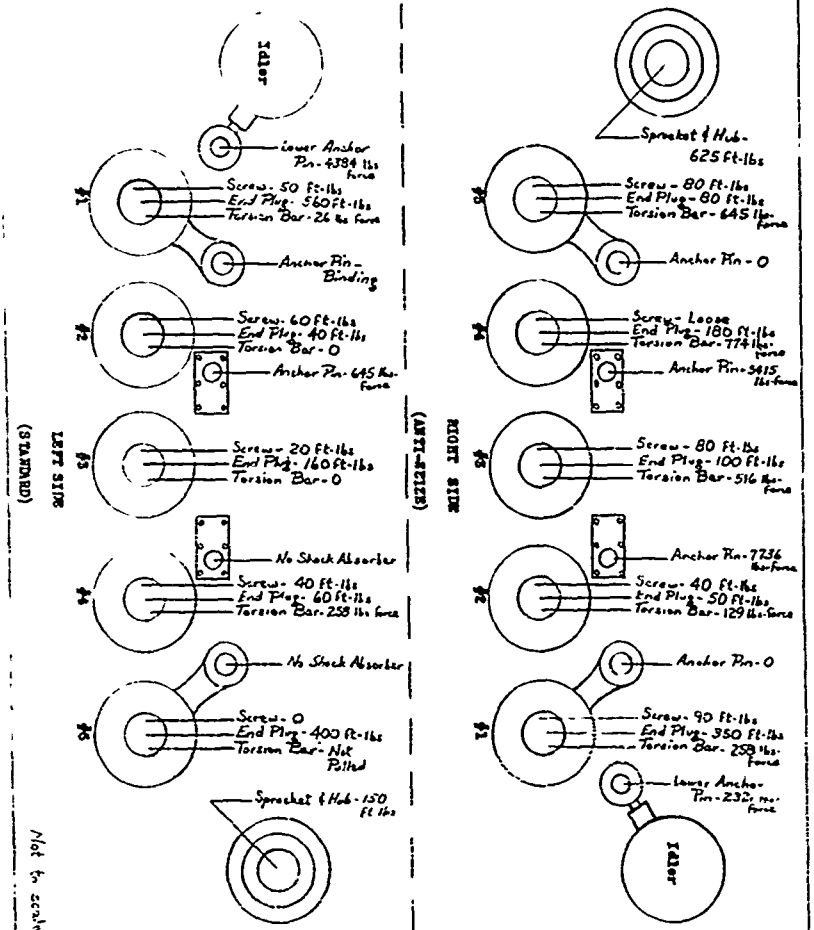

Figure 2: Comparative Amounts of Effort Required to Break Loose Parts on Tank, T95E8.

APPENDIX A

Correspondence

HEADQUARTERS
ORDNANCE TANK-AUTOMOTIVE COMMAND
DETROIT ARSENAL
28251 VAN DYKE AVENUE
CENTER LINE MICHIGAN

GPConnell/glm/23220

IN REPLY REFER TO
ORDMC-RRS.3

18 May 1959

SUBJECT: Request for Cost Estimate

TO: Commanding General
Aberdeen Proving Grounds
Aberdeen, Maryland
ATTENTION: ORDBG-DP-TU

1. In the near future an anti-seize compound will be shipped to Aberdeen Proving Grounds for field testing as to its capability to assist in the case of disassembly of mating steel surfaces.

2. Mating metal surfaces which present maintenance problems similar to those referred to in the attached test directive should be selected on any three vehicles that might be rescheduled for testing in the next six to nine months. It is desired that the three vehicles selected be of such priority that the concurrent application and evaluation of the anti-seize compound will not adversely affect any planned testing operations.

3. A cost estimate for testing on three such vehicles is requested.

4. A cost per vehicle would also be desirable.

FOR THE COMMANDER:

1 Incl
Cy of Test Directive

VICTOR H. FAGANO
Physical Sciences Laboratory
Research Division

APPENDICES

	PAGE
A, CORRESPONDENCE	A-1
B, DISTRIBUTION	B-1

APPENDIX A

Correspondence

HEADQUARTERS
ORDNANCE TANK-AUTOMOTIVE COMMAND
DETROIT ARSENAL
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FOR THE COMMANDER:

1 Incl
Cy of Test Directive

VICTOR H. FAGANO
Physical Sciences Laboratory
Research Division

TEST DIRECTIVE

a. TITLE: Evaluation of Anti-Seize Compound for Tank and Vehicle Application

b. PURPOSE OF TEST:

To establish the capability of formulations of anti-seize compounds to assist in the case of disassembly of mating steel parts, to prevent seizure, corrosion, and supply a measure of lubrication. It is desirable that the anti-seize compound test be conducted in conjunction with a basic field test.

c. BACKGROUND:

There has been a need for a coating that will aid in the disassembly of mating steel parts that are prone to seizure due to products of corrosion, etc. Such conditions have been found, between the torsion bar serrations and anchor block, between track pins and end connectors, sprocket to hub, hub to drive shaft, compensating arm spindle to hull, etc. Compounds that have successfully passed laboratory tests have been formulated and it is necessary to have them tested under field conditions to prove their value.

d. AVAILABILITY AND SELECTION OF PERTINENT HARDWARE:

All mating metal parts or components which present problems in maintenance for ease of disassembly in either combat or tactical vehicles should receive an application of the anti-seize compound to evaluate its efficacy to ease and improve maintenance problems.

e. TEST OUTLINE:

1. The anti-seize formulation to be field tested shall be applied to available selected vehicle hardware by testing station personnel according to

the attached instructions for preparing the metal surfaces and applying the compound. Compound will be supplied by Franklin Institute under separate cover.

2. In the main the method of test comparison is to contrast anti-seize compound treated metal with untreated metal undergoing the same field test conditions and operations. Some examples of the types of metal surfaces and of how this shall be done is as follows:

(a) Treat the track hardware (track pins, end connectors, center guides) of one track with anti-seize compound and leave the track hardware on the other side of the Tank untreated.

(b) Treat half the torsion bars (both serrated ends) of the Tank with anti-seize compound and leave the other half of the torsion bars untreated.

(c) Treat one sprocket to hub.

(d) Treat the hub to drive shaft.

(e) Treat one compensating arm spindle to hull.

3. In short for contrast treat one half or one side of the hardware with anti-seize compound and leave one half or the other side of the vehicle untreated for comparison of operation under the same test conditions.

4. Method of inspection should contrast degree of ease of disassembly noted between treated and untreated components and the condition of the mated metal surfaces; for example, mildly corroded, extensive corrosion, coating surface damage, etc. The condition of the surfaces should be indicated in the inspection report along with effort to disassemble and assemble.

5. After the vehicle has fulfilled its miles of test under the basic field test program run in conjunction with the anti-seize compound test it would be desirable to have continued observation of these specially treated surfaces during any subsequent testing and/or storage until normal disposition action is

ende on the vehicle.

f. SPECIAL INSTRUMENTATION:

None

g. DISPOSITION OF MATERIALS UPON CONCLUSION OF TESTS:

(See paragraph 5 of Test Outline.)

h. TYPE AND FREQUENCY OF TEST REPORTS:

Report on inspection items should be compatible with inspection and reports on basic program for example at 1000, 2000, etc., miles; a monthly progress and final report.

i. REPORT DISTRIBUTION:

Two copies of monthly and final report to OTAC, Materials Section, Physical Sciences Laboratory, Research Division, R&E Directorate, ORDXR-RPS.3.

OPConnell/glm/23220

ORDIC-RRB,3 21 July 1959

Franklin Institute
20th Street and Benjamin Franklin Parkway
Philadelphia 3, Pennsylvania
ATTENTION: Mr. D. Tholen

SUBJECT: Field Test Evaluation, Contract DA-36-034-ORD-2808 (Development of a General Purpose Anti-Noise Compound for Tank Application) at Aberdeen Proving Ground

Gentlemen:

Reference telephone conversation with Mr. C. P. Connell of this office, 17 July 1959 concerning the field test evaluations of the anti-noise compound at Aberdeen Proving Ground, the following information with regard to shipping instructions is transmitted herewith:

a. Quantity - Sufficient anti-noise compound for application to one vehicle to be shipped to Aberdeen by the end of July.

b. Shipping Address -

Commanding General
Aberdeen Proving Ground
Aberdeen, Maryland
ATTENTION: ORDIG-DP-TU, Mr. D. Miniora
Mark for IT 5100

c. Material for shipment to the same address will be required for at least an additional two (2) vehicles at some later date.

FOR THE COMMANDER:

Sincerely,

Copy furnished:
Mr. D. Miniora, APG

V. H. PAGANO
Physical Sciences Laboratory
Research Division

THE FRANKLIN INSTITUTE
OF THE STATE OF PENNSYLVANIA
PHILADELPHIA 3 • PENNSYLVANIA
FOUNDED FEBRUARY 5, 1824

PLEASE ADDRESS REPLY
TO
LABORATORIES FOR RESEARCH AND DEVELOPMENT

August 10, 1959

Commanding General
Aberdeen Proving Ground
Aberdeen, Maryland

ATTENTION: ORDBG-DP-TU, Mr. D. Misiora

For IT 5180

Gentlemen:

Enclosed find a copy of instructions for surface preparation, application, and safety precautions for use with the sample of Detroit Arsenal-Franklin Institute Experimental Anti-Seize Compound FIL 15-13-2 shipped to you on July 31.

Sincerely,

Robert A. Erb

Robert A. Erb
Project Engineer

RAE/bh
Enclosure

FIL 15-13-2

Surface Preparation Prior to Application

The surfaces to be coated must be free of grease, oil, loose rust, dirt, etc.

To insure suitable surface conditions the following precedure is to be used:

(1) Any bulk dirt, grease, etc., is wiped off with a rag.

(2) The metal surface is wirebrushed thoroughly to remove all loose flaky rust.

(3) The metal surface is then washed and rubbed vigorously with a clean cloth soaked with stabilized trichloroethylene (Military Specification MIL-T-7003) or with stoddard solvent. This is repeated until no further visible grease, loose rust, etc., is removed thereby. The surface is then dried with a clean oil-free cloth such as cheese cloth, or is air dried in clean air. The dry surface is then ready for application of the anti-seize compound.

Application Instructions

The base stock, designated FIL 15-13-2, is supplied in pint cans, as is the diluent. The diluent is methyl isobutyl ketone (MIBK), IT-M-268. The application precedure is as follows:

(1) Stir the base stock in its container until it appears completely homogeneous (no bottom settling and no thin or clear liquid on top).

(2) Mix one part by volume of the base stock to one part by volume of the MIBK and stir until completely homogeneous. This will produce the finished anti-seize compound of consistency suitable for brushing application from about 70°F to 100°F.

(3) The diluted anti-seize compound is to be applied with a high-quality paint brush of about 1"--1-1/2" width. The material should be brushed as a single coat thinly and uniformly on each of the two surfaces to be protected for any given mating fit. Extend the coatings beyond the mating area in all cases. The coatings on the two halves should be allowed to dry hard before assembly of the parts. This will take less than thirty minutes. For loose fitting parts, two coats of the anti-seize compound may be applied to each surface, allowing a thirty minute drying time between coats, with the second coat brushed on quickly with a minimum of strokes over any given area.

Safety Precautions

Care should be taken to keep the anti-seize base stock and the diluent (MIBK) away from fire, heat, or open lights as the solvent (MIBK) used throughout is moderately flammable. The Tag open cup flash point of MIBK is 98°F.

The trichloroethylene recommended for cleaning the surfaces prior to coating with anti-seize compound is the safest of the chlorinated solvents. The only important precaution is to work in a ventilated area.

Mr Wilkie/dl/46244

dec 59

ORDEC-DP-TU

SUBJECT: Cost Estimate for Test of Anti-Seize Compound

TO: Commanding General
Ordnance Tank Auto Command
Detroit Arsenal
28251 Van Dyke Avenue
Center Line, Michigan
ATTN: ORDMC-RRS.3

1. The proposal is made to cover the application of anti-seize compound to three track-type vehicles; two of the medium weight class and one of the light weight class. The components to be treated are the track, sprockets and torsion bars on one side of each vehicle. The cost for this is $14,000. $5100 each for the medium class vehicles and $3900 for the light class. This is for the application of the compound to the components and inspection at the end of operation but does not include any of the test operation.

2. The application of the compound at the time of assembly of a production or experimental vehicle to be operated on test would reduce the cost of evaluation to approximately half of the above estimates.

3. The application of a commercial anti-seize compound has been made at APG on various vehicles on several tests including fording tests in salt water and have been of material benefit on different types of fasteners.

FOR THE DIRECTOR:

BENJAMIN S. GOODWIN
Associate Director

HEADQUARTERS
ORDNANCE TANK-AUTOMOTIVE COMMAND
DETROIT ARSENAL
28251 VAN DYKE AVENUE
CENTER LINE, MICHIGAN

OPConnell/plm/23220

IN REPLY REFER TO

ORDMC-RRS.3

2 September 1959

SUBJECT: Cost Estimate for Test of Anti-Seize Compound, Letter dated 19 August 1959

TO: Commanding General
Aberdeen Proving Ground
Aberdeen, Maryland
ATTENTION: ORDBG-LP-TU, Mr. Wilkie

1. Reference Paragraph 1.

The cost estimate has been reviewed and efforts are being made to adjust the funding of the tests on the anti-seize compound to be performed at Aberdeen Proving Ground.

2. Reference Paragraph 2.

An experimental vehicle, T95 Chassis with General Motors 12 V 71T Comp. Ing. Engine is to be shipped to APG by 1 October 1959, Mr. F. J. Ginder, Project Engineer. The application of the anti-seize compound may be made during the technical inspection of the vehicle and thus reduce the cost to half the estimate of $5,100.

3. Regarding two additional test vehicles, this office would like to know if APG has a production light class vehicle and a truck available for application of the anti-seize compound. A confirming cost estimate on the T95 vehicle and the two additional vehicles would be appreciated.

4. Reference Paragraph 3.

Considerable value would be achieved, in our development project, by obtaining information as to the identity of the commercial anti-seize compound used in previous APG tests. It would be appreciated if the name and manufacturer of the formulation, used by APG could be furnished this office.

ORDBC-RRS.3 2 September 1959
SUBJECT: Cost Estimate for Test of Anti-Seize Compound, Letter dated 19 August 1959

5. Inclosed is a copy of the final report on Phase I of the Development of the Anti-Seize Compound at the Franklin Institute, Philadelphia, Pa., for your review.

6. Franklin Institute advised that the formulation shipped to APG, 31 July 1959, ATTENTION: ORDBG-DP-TU, Mr. D. Misiora, Marked for IT 5180, is designated F.I.L. 15-13-2.

FOR THE COMMANDER:

1 Incl
Cy Report on
Phase I of Development
of Anti-Seize Compound

V. H. PARANO
Physical Sciences Laboratory
Research Division

WORK ORDER	Fuhse/jar/22272	3. DATE 6 October 1959
1. TO (PASS) Commanding General Aberdeen Proving Ground	2. FROM (OSO) OTAC ORDMC-RP.4	4. DOCUMENT CONTROL NO. 9-1-0-052-041-04:-1

5. ONE CODE AND TITLE

5010.11.50000.01 Liquid Hydrocarbon Fuels and Combustion

6. Appropriate Accounting Class. of Funds (to be) Made Available:	7.a. Elements	b. Quantity Unit	c. Unit Cost	d. Total Cost
21X2040 05-4211 P5010	Prior			
	Increase	N/A	N/A	9,000.00
	Decrease			
	Current	N/A	N/A	9,000.00
	Authority	Par Para 15c	ORDM 1-6	

8 Performance of the Following Work is Authorized (Subject to Availability of Funds)

Aberdeen Proving Ground shall furnish the necessary labor, materials, equipment and facilities required in support of this project.

JOB A.

1. Evaluation of Anti-Seize Compound for Tank and Vehicle Application at Aberdeen Proving Ground.

a. This test shall be in accordance with attached Test Directive IT 5180.

b. Estimated cost of Test:

Vehicle - T95	$2,550*
M59(Final Drive Test)	3,900
	$6,450**

*Half actual cost since initial application work is to be conducted along with normal technical inspection.

**Represents estimate developed by APG and transmitted to OTAC by letter from OEDEG-DP-TU dated 19 August 1959, subject: Cost Estimate for Test of Anti-Seize Compound and telephone conversation 14 September 1959.

9. DELIVERY SCHEDULE & INSTRUCTIONS

10. ENCLOSURES:

FOR USE BY ADDRESSEE	11. AUTHORIZED BY:
12. CONTRACT ACTIONS	6 October 1959 W. R. SWENOR
a. DATE	DATE Typed Name
b. NUMBER	W R Swenor
c. AMOUNT	Signature
	Chief, ORDMC-RP.4
	Title

DD FORM AOS-20
15 Apr 59

A-12

Army-OTAC-Detroit

OMS Code 5010.11.80000.01

Document Control No. 0-1-0-052-041-041-1

c. Test to be conducted at Aberdeen Proving Ground
d. Estimated time of performance:
   a. Starting date: October 1959
   b. Completion date: June 1960

2. This Program is being undertaken in conjunction with Franklin Institute Contract DA-36-034-ORD-2808-RD "The Development of Anti-Seize Compound for General Application".

3. Project Engineer: G. P. Connell Extension 23220 Project No: TB5-1

4. Total estimated Program Authority for this job -- $6,450.00

THE FRANKLIN INSTITUTE
OF THE STATE OF PENNSYLVANIA
PHILADELPHIA 3 • PENNSYLVANIA
FOUNDED FEBRUARY 5, 1824

PLEASE ADDRESS REPLY
TO
LABORATORIES FOR RESEARCH AND DEVELOPMENT

October 27, 1959

Commanding General
Aberdeen Proving Ground
Aberdeen, Maryland

Attention: ORD RG-DP-TU, Mr. B. Goodwin, Mr. Wilkie

For IT 5180

Gentlemen:

This is a word of explanation with regard to the testing of the Detroit Arsenal-Franklin Institute Experimental Anti-Seize Compounds on the M-59 and T-95 tank vehicles.

The compound shipped to Aberdeen (to the attention of Mr. D. Misiora) on July 31, 1959, designated as FIL 15-13-2, is to be applied specifically to the M-59 tank. The instructions for applying compound FIL 15-13-2 were mailed to the attention of Mr. Misiora on August 10.

The compound for use on the T-95 tank vehicle will be shipped to Aberdeen at the beginning of November. Instructions for applying this (different) compound will be forwarded at the same time that the sample is shipped.

If there are any questions concerning the identity or application of the compounds, feel free to contact me.

Sincerely,

Robert A. Erb

Robert A. Erb
Project Engineer

RAE/bh

THE FRANKLIN INSTITUTE
OF THE STATE OF PENNSYLVANIA
PHILADELPHIA 3 · PENNSYLVANIA

PLEASE ADDRESS REPLY TO LABORATORIES FOR RESEARCH AND DEVELOPMENT

FOUNDED FEBRUARY 5, 1824

November 16, 1959

Commanding General
Aberdeen Proving Ground
Aberdeen, Maryland

Attention: ORD BG-DP-TU, Mr. B. Goodwin, Mr. Wilkie for IT 5.80.

Gentlemen:

Under separate cover we are mailing to you on November 17 approximately one gallon total of base stock and diluent (two packages) of Franklin Institute - Detroit Arsenal Experimental Anti-Seize Compound designated FIL 15-13-2A. This material is for use on the T-95 tank vehicle.

Enclosed with this letter are the necessary application instructions.

Very truly yours,

Robert A. Erb

Robert A. Erb
Project Engineer

RAE:mm
Enclosure

SURFACE PREPARATION PRIOR TO APPLICATION OF EXPERIMENTAL

DETROIT ARSENAL--FRANKLIN INSTITUTE ANTI-SEIZE COMPOUND

The surfaces to be coated must be free of grease, oil, loose rust, dirt, etc.

To insure suitable surface conditions the following procedure is to be used:

(1) Any bulk dirt, grease, etc., is wiped off with a rag.

(2) The metal surface is wire-brushed thoroughly to remove all loose or flaky rust.

(3) The metal surface is then washed and rubbed vigorously with a clean cloth soaked with stabilized trichloroethylene (Military Specification MIL-T-7003). This is repeated until no further visible grease, loose rust, etc., is removed thereby. The surface is then dried with a clean oil-free cloth such as cheese cloth, or is air dried in clean air. The dry surface is then ready for application of the anti-seize compound.

APPLICATION INSTRUCTIONS FOR THE EXPERIMENTAL

DETROIT ARSENAL--FRANKLIN INSTITUTE ANTI-SEIZE COMPOUND

Base stock and diluent materials sufficient to make more than one gallon of anti-seize compound at brushing consistency have been forwarded for this testing program.

This base stock, designated FIL 15-13-2A is supplied in quart cans, with the diluent in a gallon can. The diluent is methyl isobutyl ketone (MIBK), TT-M-268. The application procedure is as follows:

(1) Stir the base stock in its container until it appears completely homogeneous (no bottom settling and no thin or clear liquid on top).

(2) Mix one part by volume of the base stock to one part by volume of the MIBK and st r until completely homogeneous. This will produce the finished anti-seize compound of consistency suitable for brushing application from about 70°F to 100°F.

(3) The diluted anti-seize compound is to be applied with a high-quality paint brush of about 1"--1-½" width. The material should be brushed as a single coat thinly and uniformly on each of the two surfaces to be protected for any given mating fit. Extend the coatings beyond the mating area in all cases. The coating on the two halves should be allowed to dry hard before assembly of the parts. For application to screw threads and most parts allow 30 minutes dry time before assembly. For torsion bar serrated ends alow two hours dry time before assembly. For loose fitting parts, two coats of the anti-seize compound may be applied to each surface, allowing a thirty minute drying time between coats, with the second coat brushed on quickly with a minimum of strokes over any given area.

SAFETY PRECAUTIONS FOR USE WITH THE EXPERIMENTAL

DETROIT ARSENAL--FRANKLIN INSTITUTE ANTI-SEIZE COMPOUND

Care should be taken to keep the anti-seize base stock and the diluent (MIBK) away from fire, heat, or open lights as the solvent (MIBK) used throughout is moderately flammable. The tag open cup flash point of MIBK is 98°F.

The tricholoroethylene recommended for cleaning the surfaces prior to coating with anti-seize compound is among the safest of the chlorinated solvents. The only important precaution is to work in a ventilated area.

COPY/ej 24 March 1960

DISCUSSION AT APG BY MR. CONNELL, OTAC WITH PROVING GROUND PERSONNEL CONCERNING ANTI-SEIZE COMPOUND

The intended service of the anti-seize compound developed by Franklin Institute is to be used to fill close clearance slide fits but not threaded fittings or pressed fits, however it may be applied in such areas.

The approved anti-seize compound, MIL-A-13881, should be investigated to determine its ability to serve the same purpose.

The expected points of application include turret race, track end connectors, wedges, center guides and pads, torsion bar anchors, link pins and other close clearance fits.

APG Personnel:
R. F. Wilkie
G. Paganussi
C. Schwarz

APPENDIX B

Distribution

NAME AND ADDRESS	NO. COPIES
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ORDPM	1
Commanding General Ord Tank-Auto. Command Detroit Arsenal Center Line, Michigan ATTN: ORDMX-AL	1
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ORDMC-RSC	1
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ORDMC-RSC-3	2
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ORDMC-RRC	1
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The Franklin Institute of the State of Pennsylvania Philadelphia 3, Pennsylvania	1
Commanding Officer Diamond Ord Fuze Lab Washington 25, D. C. ATTN: ORDTL 012	1
Commanding Officer U.S. Army Ord Test Activity Yuma Test Station Yuma, Arizona ATTN: OPDBG-TA-AS	1

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Canadian Army Staff 2450 Mass. Ave., N. W. Washington 8, D. C. ATTN: GSC-1, ASN Sec THRU: OCO-ORDGU-SE	2
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Air Force Systems Command Liaison Office Aberdeen Proving Ground, Md.	1
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AD _____ Accession No. _____
DAPG, Aberdeen Proving Ground, Maryland
EVALUATION TEST OF ANTISEIZE COMPOUND FOR TANK AND VEHICLE APPLICATION - J. F. Crox

Report No. DPG-252, July 1961
OMI Code 5010.11.80000.01
DA Project 551-01-011
Unclassified Report

Test antiseize compound, F.I.L. 15-13-2, was applied to steel mating parts on an M59 armored personnel carrier, and the vehicle was operated 3090 miles. Test antiseize compound, F.I.L. 15-13-2A, was applied to the steel mating parts on a T95E3 tank, and the vehicle was operated for 204 miles, and parked exposed to the effects of all types of weather. Neither compound met the standards necessary for acceptance.

AD _____ Accession No. _____
DAPG, Aberdeen Proving Ground, Maryland
EVALUATION TEST OF ANTISEIZE COMPOUND FOR TANK AND VEHICLE APPLICATION - J. F. Crox

Report No. DPG-252, July 1961
OMI Code 5010.11.80000.01
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